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| APPLICATION NO.            | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|----------------------------|-------------|----------------------|---------------------|------------------|
| 10/622,028                 | 07/16/2003  | Guillermo Rozas      | TRAN-P045           | 2248             |
| 7590                       | 08/11/2005  |                      | EXAMINER            |                  |
| WAGNER, MURABITO & HAO LLP |             |                      | TRAN, DENISE        |                  |
| Third Floor                |             |                      | ART UNIT            | PAPER NUMBER     |
| Two North Market Street    |             |                      |                     |                  |
| San Jose, CA 95113         |             |                      | 2189                |                  |
| DATE MAILED: 08/11/2005    |             |                      |                     |                  |

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                |                         |  |
|------------------------------|--------------------------------|-------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b>         | <b>Applicant(s)</b>     |  |
|                              | 10/622,028                     | ROZAS ET AL.            |  |
|                              | <b>Examiner</b><br>Denise Tran | <b>Art Unit</b><br>2189 |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 12 May 2004.

2a) This action is FINAL.                    2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-37 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

5) Claim(s) \_\_\_\_\_ is/are allowed.

6) Claim(s) 1-37 is/are rejected.

7) Claim(s) \_\_\_\_\_ is/are objected to.

8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 16 July 2003 is/are: a) accepted or b) objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All    b) Some \* c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

|  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                     | Paper No(s)/Mail Date. _____ .  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|  | 6) <input type="checkbox"/> Other: _____ .                                  |

## **DETAILED ACTION**

1. Claims 1-37 are presented for examination.
  
2. The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

3. The abstract of the disclosure is objected to because the abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. Correction is required. See MPEP § 608.01(b).
  
4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1-5, 13-16, and 22-37 are rejected under 35 U.S.C. 102(e) as being anticipated by Shibayama et al., US2003/0014602 (hereinafter Shibayama).

As per claims 1, 13, 22, 28 and 33, Shibayama teaches the use of a data cache comprising:

a plurality of cache lines, each cache line including a state indicator for indicating anyone of plurality of states, where the plurality of states includes a speculative state to enable keeping track of speculative modification to data in the respective cache line(e.g. paragraph 45), wherein the speculative state enables a speculative modification to the data in the respective cache line to be made permanent in response to a first operation (e.g. paragraphs 87 and 92), and wherein the speculative state enables the speculative modification to the data in the respective cache line to be undone in response to a second operation (e.g. paragraph 189) and a processor operative to perform a speculative store operation to the data cache (e.g. paragraph 87).

As per claims 2, 23-24, 29-30 and 34-35, Shibayama teaches the use of the plurality of states includes an invalid state, a dirty state and a valid state (e.g. paragraph 45).

As per claims 3, 14, 25, 31 and 36, Shibayama teaches the use of the first operation as a commit operation (e.g. paragraphs 87 and 92).

As per claims 4, 15, 26, 32 and 37, Shibayama teaches the use of the second operation as a rollback operation (e.g. paragraph 189).

As per claims 5, 16 and 27, Shibayama teaches the use of before speculatively modifying a cache line that is in a dirty state, the cache line is cleaned by writing back to memory the dirty data of the cache line (e.g. paragraphs 45 and 155).

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 6-10, 12,17-19, and 21 rejected under 35 U.S.C. 103(a) as being unpatentable over Shibayama et al., US2003/0014602 (hereinafter Shibayama), in view of The Cache Memory Book, Handy, 1998, pages 66, 77-86.

As per claims 6, 12, 17 and 21, Shibayama shows the use of a data cache comprising:

a plurality of cache lines, each cache line including a state indicator for indicating anyone of plurality of states, where the plurality of states includes a speculative state to enable keeping track of speculative modification to data in the respective cache line(e.g. paragraph 45), wherein the speculative state enables a speculative modification to the data in the respective cache line to be made permanent in response to a first operation (e.g. paragraphs 87 and 92), and wherein the speculative state enables the speculative modification to the data in the respective cache line to be undone in response to a second operation (e.g. paragraph 189).

Shibayama does not specifically show the use of a fully associative speculative cache buffer for receiving cache lines which are evicted from the data cache and have one of a second plurality of states. Handy shows the use of a fully associative cache buffer for receiving cache lines which are evicted from the data cache and have one of a second plurality of states (e.g. pages 66 and 77-86). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine Handy with Shibayama because it would provide for a reduction in the main memory write cycle time.

As per claims 7 and 18, Shibayama shows the use of the plurality of states includes an invalid state, a dirty state and a valid state (e.g. paragraph 45).

As per claim 8, Shibayama shows the use of the first operation as a commit operation (e.g. paragraphs 87 and 92).

As per claim 9, Shibayama shows the use of the second operation as a rollback operation (e.g. paragraph 189).

As per claims 10 and 19, Shibayama shows the use of before speculatively modifying a cache line that is in a dirty state, the cache line is cleaned by writing back to memory the dirty data of the cache line (e.g. paragraphs 45 and 155).

8. Claims 11 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibayama et al., US2003/0014602 (hereinafter Shibayama).

As per claims 11 and 20, Shibayama does not specifically show the use of second states which include evicted, dirty, speculated data. However, "Official Notice"

is taken that both the concept and advantages of providing for second states which include evicted, dirty, speculated data is well known and expected in the art. It would have been obvious to one of ordinary skill in the art to include second states which include evicted, dirty, speculated data to Shibayama because it would provide for data coherency throughout the memory system. The eviction cache buffer is still part of the memory hierarchy and for that purpose the status of the data should be kept. For example, if there is a read/write miss in cache and the eviction cache buffer has not yet written its contents back to main memory the information can be pulled from the eviction cache buffer, thereby reducing memory access time.

9. The following prior arts have been cited but not relied upon:

- a) Naruse et al. 6,526,480 shows the use of a MESIU protocol, where U represents a speculative state.
- b) Ramagopal et al. 5,838,943 shows the use of speculative loads and stores using MESI.
- c) Atallah et al. 5,802,574 shows the use of data being marked when it is speculative within a MESI protocol.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Denise Tran whose telephone number is (571) 272-4189. The examiner can normally be reached on Monday, Thursday, and Friday from 9:00 a.m. to 5:30 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim, can be reached on 571-272-4182. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Denise Tran

8/8/05